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Online Diabetes Program Improving Nurses’ Competency in School-Age Diabetes Care

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Submitted in Partial Fulfillment of the Requirements for the Doctor of Nursing Practice Degree

Project Committee

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Abstract

Background: Diabetes affects over 280,000 children under 20 in the US, requiring specialized knowledge and skills for management. In a large urban school district with 54,000 students, 159 have diabetes, cared for by 158 school nurses. These nurses often struggle with the complexities of diabetes care and lack standardized training, leading to potential suboptimal care. An online diabetes education program was implemented to improve their competency, knowledge and skills, and confidence in managing diabetes in school-age children.

Methods: An asynchronous online competency-based diabetes education program to improve nurses’ competency to care for school-age children with diabetes was implemented in an urban public school district to address several issues, including a lack of standardized training, familiarity with diabetes equipment, and access to up-to-date resources.

Intervention: The intervention took place in three phases: pre-implementation, implementation, and post-implementation. The pre-implementation phase included developing the education program and surveys and pre-testing (pilot) the program to seven school nurses. Implementation involved inviting 144 school nurses to participate and complete the program. The post-implementation phase included data analysis and synthesis.

Results: Stakeholders convened to develop the education program and surveys. Seven school nurses participated in the pilot program, deeming it 100% feasible and clear. Sixty percent (n=87) of school nurses participated in the program and 49 completed the entire program including the pre-test, watching the education video, post-test, and post-program satisfaction survey. Participants had a 7% increase in knowledge, a 10% increase in skill self-assessment, and an 18% increase in confidence after engaging in the program. Additionally, 98% of participants reported satisfaction with the program.

Conclusions: Implementation of the locally tailored asynchronous online diabetes education program was effective in increasing nurses’ competency, knowledge and skills, and confidence to care for school-age children with diabetes. The program has the potential of being sustained, standardized, and mandated for all district school nurses as part of their orientation and training. Furthermore, the diabetes education program may serve as a valuable resource for the district to develop educational programs about other chronic conditions. Future research should explore the impact of the diabetes education program on students’ diabetes care.
Introduction

Problem Description

Diabetes is one of the most common chronic conditions among children. Currently, in the United States there are more than 280,000 children under the age of 20 with a diagnosis of diabetes (American Diabetes Association [ADA], 2022). The bulk of daytime hours for this population are typically spent in the school setting. The care and management of children with diabetes requires specialized knowledge and skills. Daily care is multifaceted and includes blood glucose monitoring, nutrition calculations and supervision, and daily medication administration including insulin injections or the use of an insulin pump. To effectively manage a child’s diabetes care during the school day and avert serious medical complications and emergencies, a school nurse is essential. Despite being the most recognized person to manage a child’s diabetes in school (ADA, 2022), a nurse’s ability to do so varies depending upon their knowledge, skills, and confidence. Additionally, there are barriers to obtaining continuing education which include time constraints, cost, family obligations, lack of available substitute coverage at school, and the inability to attend during the school year (Bachman & Hsueh, 2008). School nurses' knowledge of diabetes has been found to be insufficient (Kobo et al., 2020) and it is imperative for school nurses to have mandatory training on diabetes care management (Stefanowicz-Bielska et al., 2022).

Local Problem

A large urban public school district services 54,000 students in 125 schools. One hundred and fifty-nine of these students have diabetes, 120 with type I diabetes and 39 with type II diabetes. These children spend six to ten hours of their day in school. One hundred and fifty-eight school nurses care for these children. According to district information in 2019-2020,
school nurses completed 13,568 chronic illness management activities, 139,080 treatment and medication activities, and 106,510 case management activities. Diabetes care is included in this data. The increasing number of children with diabetes and the complexity of diabetes care are challenging school nurses’ ability to effectively manage a child’s diabetes during the school day, including the need for blood glucose monitoring, insulin administration, the treatment of low or high blood glucose, and care coordination. In addition, nurses may not be familiar with the medications, equipment, and technology for diabetes care, including glucometers, continuous glucose monitors [CGM], insulin, and insulin pumps. Nurses assigned to a school as the only clinician may feel isolated and alone; often diabetes care consultation with a peer may be beneficial and can positively affect diabetes management. The highest level of school nursing competency is enhanced by collaborating with peers (American Nurses Association & National Association of School Nurses, 2017). Diabetes knowledge and confidence to care for students with diabetes among school nurses are variable due to experience, education, and motivation. Nurses in the school district need and want the education to adequately care for the unique needs of children with diabetes.

Despite the presence of mandatory trainings and professional development opportunities related to diabetes care management, there is currently no standardized orientation program specifically tailored for school nurses focusing on diabetes management within the context of this large urban public school district. Nurses seeking employment in public schools in this state must obtain licensure from the Department of Elementary and Secondary Education (DESE), which requires completing an orientation program outlined by the Department of Public Health (MDPH). While two of the mandated trainings, Foundations of School Nursing Practice and Medication Administration in a School Setting, fulfill the educational prerequisites for school
nurses and discuss diabetes management in school settings, there remains an absence of a comprehensive orientation program solely dedicated to this aspect. The large urban public school district offers opportunities for school nurses to engage in professional development courses related to diabetes management through partnerships with local hospitals, along with providing resources and guides for managing diabetes care within the school setting. To bridge this gap in practice and improve nurses’ competency, knowledge and skills, and confidence to care for school-age children with diabetes, an asynchronous online diabetes education program was implemented with the goal that it will be sustainable, updated as needed, and standardized so that nurses feel adequately prepared in their role as a school nurse. The online course would also meet the recommendation of the district’s policy to support professional development of school nurses. This document's format is adapted from Squire 2.0 guidelines for performance improvement and quality improvement projects (Ogrinc et al., 2015).

Available Knowledge

The goal of diabetes treatment in children is achieving and maintaining optimal blood glucose control. Insulin therapy is the primary treatment method, although this treatment includes the risk of both hypoglycemia and hyperglycemia. To achieve treatment goals, delay or prevent complications of diabetes, and engage in all school activities, diabetes management is dependent on school personnel who are knowledgeable about diabetes and able to ensure that children with diabetes are medically safe at school (ADA, 2022). Evolving science and technology in diabetes care make it challenging for nurses to maintain up-to-date knowledge and skills to manage students’ individualized care plans (Bobo et al., 2011). Additionally, there is no standardized diabetes training for school nurses and access to continuing education resources are limited, resulting in a lack of confidence among school nurses regarding diabetes care
management (Berget et al., 2019). Inadequate management of diabetes can hinder the achievement of optimal blood glucose levels and may adversely impact one's quality of life. Therefore, as the number of children with diabetes and the complexity of treatment increases, it is necessary that school districts improve diabetes care resources for staff to ensure a healthy and safe school environment for children with diabetes (Berget et al., 2019).

A PRISMA-guided search of the literature was conducted to explore effective strategies to increase school nurses’ competency to care for school-age children with diabetes. The databases searched were CINAHL, OVID, and PubMed. Search terms included “school nurse,” “nurse,” “nurse knowledge,” “nursing competencies,” “diabetes,” “children,” “child,” and “competencies.” The search was refined to include full text documents and exclude nursing students. Studies that did not have a specific strategy or intervention were excluded from the evidence table, Appendix A, and the results included six studies. Two of these studies involved in-person diabetes continuing education programs and four of the studies examined online education programs. The John Hopkins tool was used to evaluate the quality of the studies (Dang & Dearholt, 2018). Each study was a qualitative study classified as evidence level III with a quality rating of A or B.

One study found that an in-person diabetes continuing education program, group session, for two hours improved school nurses’ diabetes competency in care tasks and pathophysiology by 2.7-31.8% (Berget et al., 2019). Similarly, another study concluded that a one-day, group in-person continuing education program increased school nurses’ level of self-rated experience and competency in providing diabetes care in symptom management, administration of medication, diet and activity management, and teaching and supporting others by 16-40% (Breneman et al., 2015).
Four studies showed that online diabetes continuing education is an effective strategy to improve nurses’ competency in caring for students with diabetes. One study found that a rapid, individual, one session, online continuing education program increased school nurses' knowledge in diabetes management, equipment, diet, psychological impacts, and type 2 techniques by 45-99.6% (Rhodes et al., 2019). Another study found that a four-session, one-hour, weekly online group education program increased school nurses’ self-efficacy in pathophysiology of diabetes, insulin technology, insulin management, and developmentally appropriate care by 25% (Shimaski et al., 2021). A third study concluded that a self-paced, one-day online diabetes education program increased nurses’ knowledge in diabetes basics, hypoglycemia, hyperglycemia, and ketones by 18-52%, as well as increased nurses’ confidence by 61.86% (Taha et al., 2018). Additionally, a fourth study found that a single, two-hour group online continuing education program improved knowledge on diabetes technology, basic management, hyperglycemia, and ketone management by 74-84% (Zimmerman et al., 2022).

Rationale

One of the study’s online module and design was based on a conceptual model, the ICARE framework (Rhodes et al., 2019). The ICARE framework is a scaffolding model based on learning theory. The scaffolding model allows learners to pace and enhance their learning and experience into smaller, more manageable pieces (Salyers et al., 2014). Although instructive, the ICARE framework was not used in this quality improvement project. Rather, constructivist learning theory guided the development of the online diabetes education program for school nurses in an urban public school district who care for school-age children with diabetes. The constructivist learning theory is a student-centered approach to learning that emphasizes active engagement and the construction of knowledge by the learner (Piaget et al., 1973).
This theory has several points of emphasis. First, the constructivist approach emphasizes the importance of connecting new information to prior knowledge and experiences (Piaget et al., 1973). This is particularly relevant in the case of diabetes education, where school nurses may have varying levels of prior knowledge and experience with the condition. The online program was tailored to the existing knowledge and experiences of district school nurses and related them to new information to build a more personal, detailed, and comprehensive understanding of diabetes. Second, the constructivist approach recognizes the importance of social interaction in learning (Piaget et al., 1973). While online learning can be isolating to learners, the online diabetes program was designed specifically to address the needs of the district school nurses, thereby purposefully fostering a sense of community and support.

Third, the constructivist approach emphasizes the active role of the learner in constructing their own knowledge (Piaget et al., 1973). Rather than just receiving information passively, learners in a constructivist program are encouraged to engage with the content, ask questions, and explore their own ideas and interests (Magnussen, 2006). This can be beneficial in a field like diabetes education, where the science and treatment of the condition is constantly evolving. The online program incorporated case studies so nurses could participate in active learning and understanding of the content. Overall, by applying the constructivist learning theory to the implementation of the online diabetes education program for school nurses, the program provided a more engaging, supportive, and effective learning experience, leading to better diabetes care for students.

Kurt Lewin’s nursing theory of change guided the implementation of the online education program for school nurses caring for school-age children with diabetes. Lewin’s theory of change and the three stages of the model, unfreezing-change-refreezing, require prior practice to
be rejected and replaced (Lewin, 1947). The local problem of insufficient nursing knowledge in diabetes care required that preexisting district practice, namely the lack of a standard diabetes education program, be abandoned, “unfreezing”, and supplemented with the education program, “change”. The implementation of the online diabetes education program achieving sustainability and establishing it as standard practice is a process described by Lewin as "refreezing” (Lewin, 1947).

School nurses play a crucial role in the care of school-age children with diabetes. The complexity of diabetes management and the relatively rapid changes in technology require nurses to maintain up-to-date information and skills to manage a student’s diabetes care safely and effectively and, importantly, the ADA (2022) identifies it as a professional responsibility. Acquiring diabetes knowledge and education can be challenging due to time constraints, cost, and accessibility. Online education programs provide nurses with control, flexibility, and the ability to overcome barriers to learning (Rhodes et al., 2019). A randomized study by Donkin et al. (2022) found that eLearning was comparable to face-to-face teaching in a nursing education course. Similarly, the implementation of an online education module based on constructivist learning theory for medical-surgical nursing students was found to have higher scores for students who engaged in an online learning module (Mosca, 2016).

Based upon the strength of the evidence reviewed, Appendix A, and the needs of the urban public school district, the intervention best suited was an online diabetes education program to improve school nurses’ competency, knowledge and skills, and confidence to care for school-age children with diabetes.

Specific Aims
The project's purpose was to indirectly improve the care of school-age children with diabetes who attend public school in an urban district. The overarching aim was to develop, implement, and evaluate an asynchronous online competency-based diabetes education program for school nurses to increase competency, knowledge and skills, and confidence. The specific aims of the improvement project included:

- Convene stakeholders to develop an asynchronous online competency-based diabetes education program for school nurses in an urban public school district.
- Deploy this program to five to ten school nurses in an urban public school district to assess feasibility and clarity of the education program.
- Deploy an asynchronous online competency-based diabetes education program to 85% of school nurses in an urban public school district.
- 85% of school nurses who engage in an asynchronous online competency-based diabetes education program will have an increase in competency, knowledge and skills, and confidence to care for school-age children with diabetes in an urban public school district.
- 85% of school nurses who participate in an asynchronous online competency-based diabetes education program will be satisfied with the education initiative.

Methods

Context

The microsystem setting for the implementation of the asynchronous online competency-based diabetes education program for school nurses who care for school-age children with diabetes was a large, 54,000 student, urban public school district. This microsystem meets successful characteristics in patient focus, community and market focus, performance results,
and integration of information and technology. Upon consideration of additional characteristics of this practice environment, process improvement was identified as a characteristic that was not meeting success standards and correlates to the implementation of this improvement project. Process improvement occurs in an atmosphere that fosters learning and redesign and empowers staff to be innovative. This urban public school district lacks resources, including standardized training, financial support, and time necessary for improvement work. Any improvement work occurs outside of the workday schedule.

The external context of the urban public school district and the subpopulation of school nurses’ caring for students with diabetes across all grade levels are shown in Appendix B. The mapping tool illustrates the resources explored and the relationships identified in this environment. These include students; families; primary care providers; medical specialists such as endocrinologists; school administration; teachers; service providers such as occupational therapy, physical therapy, speech, and vision; cafeteria staff and lunch monitors; nutritional services; behavioral health services; health services department and administration; transportation; the special education department; and other school nurses. The needs of school nurses to care for a student with diabetes are depicted (Appendix B) and include communication with families, medication orders, individualized health care plans, 504 plans, plans that provide accommodations for a child with a disability to access the curriculum, medical supplies, teacher education, communication with the school community, need to know staff, school menu ingredients, and diabetes training. The vital nature of achieving optimal health outcomes for school-age children with diabetes in an urban public school district is highlighted by the related numerous resources, relationships, and school nurse needs, depicting a complex system appropriate for this targeted improvement intervention.
The impetus for this improvement project was insufficient school nurse competency, knowledge and skills, and confidence to care for school-age children with diabetes. Numerous factors were associated with this problem across many domains, which included people, process, equipment, materials, environment, and management. This cause-and-effect relationship is illustrated in Appendix C. To address targeted causes of the problem, an asynchronous online diabetes education program was deployed to all school nurses, grades K-12, in the urban public school district. The implementation of the education program intended to address nurses’ lack of mandated training; limited experience with the technology involved in diabetes management; a lack of standardized school nurse orientation or diabetes competency training; a lack of familiarity with diabetes equipment including glucometers, continuous glucose monitors, insulin administration, and insulin pumps; a lack of access to up-to-date resources and guidelines; and barriers to attending continuing education such as time, cost, and substitute nurse coverage.

Current and potential forces for and against the successful implementation of the online diabetes program in the urban public school district existed, see Appendix D. The current driving forces that were identified in making the improvement program successful were professional practice updates, evidence-based practice (EBP), nurses’ motivation to learn, and the need for a district diabetes training/orientation program. The current restraining forces were nurses’ and leadership’s fear of change, identifying a training resource to use, and time to develop the training program. Potential enabling forces were an increase in nurses’ competency, knowledge and skills, and confidence, improved health outcomes, and a standardized nurse diabetes education program. The potential restraining forces that hindered the implementation of the online diabetes education program were time for the training to occur, nurses’ compliance with completing the training, and updating the training information annually.
**Intervention**

The improvement project, an asynchronous online competency-based diabetes education program to increase nurses’ competency, knowledge and skills, and confidence, is depicted in Figure 1.

**Figure 1**

The intervention process can be described in three phases: pre-implementation, implementation, and post-implementation. Pre-implementation began in December of 2022 with the determination that an online education program was the strategy that best fit the needs of all school nurses in the school district. A proposal was written and pitched to stakeholders/team in the spring of 2023. The stakeholders convened and chose an asynchronous online program as the learning platform to deliver diabetes education via google classroom. During the summer and fall of 2023, an asynchronous online diabetes education program was developed by the project.
manager and intervention team. The program was adopted from the American Diabetes Association training modules and formatted specifically for school nurses in the large urban public school district. The education video was 80 minutes in length and learning objectives included diabetes mellitus overview, diabetes medical management plans, blood glucose monitoring, glucagon, insulin, ketones, nutrition and physical activity, and type 2 diabetes. Additionally, a pre- and post-knowledge, skills, and confidence survey and a satisfaction survey, all google forms, were developed. Next, the education program was emailed and pre-tested, referred to as piloted, to seven school nurses to assess feasibility and clarity. These nurses either volunteered or were recommended by leadership based on their expertise in diabetes care. The project's implementation began with obtaining the names of all school nurses, 158 in number. Nurses who engaged in the pilot program (n=7), the project leader (n=1), and six nurses (n=6) on medical leave were excluded. Therefore, 144 school nurses were invited to participate. On December 21, 2023, an announcement via zoom and information about the diabetes education program was presented to school nurses during a nursing monthly meeting. Next, on January 8, 2024, an invitation via google classroom and email was sent to all the school nurses to complete the asynchronous online diabetes education program. Once a nurse accepted the google classroom invitation, access to the education program was obtained. The education program included viewing the diabetes education video, a pre- and post-knowledge, skills, and confidence survey, and a post-program satisfaction survey. The education program remained accessible until March 8, 2024, to give nurses ample time to complete the program at their convenience. Additionally, reminders and an incentive were added to increase participation rates. Next, the results of the pre- and post-survey and satisfaction survey were analyzed. This concluded the post-implementation phase of the intervention.
Evaluation of the Intervention

A logic model, Appendix E, outlines the connections between the various components of the education initiative and demonstrates the planning, development, implementation, and evaluation of the program. It provides a clear and concise description of how the program worked, the aims, and how it was evaluated. The logic model for the online education program illustrated the inputs, activities, outputs, and outcomes intended by the initiative. The logic model helped to ensure that stakeholders, specifically nursing administration, have a shared understanding of the program's goals, activities, and intended outcomes, and provided a framework for tracking progress and measuring success. The ultimate indirect impact of the education initiative was to improve the health of school-age children with diabetes.

The Plan-Do-Study-Act [PDSA] was the guiding framework for assessing the impact of the online competency-based diabetes education program for school nurses who care for school-age children with diabetes. The PDSA cycle is a continuous improvement process that involves four stages: Plan, Do, Study, and Act (Langley, 2009). In the “plan” stage, the goals and objectives of the diabetes education program were clearly defined. The project's purpose was to improve the care of school-age children with diabetes who attend an urban public school district. The overarching aim was to develop, implement, and evaluate an asynchronous online competency-based diabetes education program for school nurses to increase nurses’ competency, knowledge and skills, and confidence. School nurses were the target audience of the intervention. The aims/expected outcomes of the education initiative were to convene stakeholders to develop an asynchronous online diabetes education program for school nurses in an urban public school district; deploy the program to five to ten school nurses in an urban public school district to assess feasibility and clarity of the education program; deploy an asynchronous online diabetes
education program to 85% of school nurses in an urban public school district; 85% of school nurses who engaged in the asynchronous online diabetes education program would have an increase in competency, knowledge and skills, and confidence to care for school-age children with diabetes in an urban public school district; and 85% of school nurses who participated in the asynchronous online diabetes education program would be satisfied with the education initiative. The program's implementation began in January of 2024.

In the “do” stage, the asynchronous online diabetes education program was deployed. Access to pre- and post-surveys for knowledge, skills, and confidence, the education program, and a post-program satisfaction survey were emailed via google classroom to school nurses. This data was collected to assess the program’s effectiveness. In the “study” stage, the data collected during the implementation stage was analyzed to determine the effectiveness of the online diabetes education program. This included assessing the competency, knowledge and skills, and confidence gained by the school nurses, evaluating their ability to apply the knowledge to their work, and identifying any areas of improvement.

In the “act” stage, the insights gained from the study stage will be used to make improvements to the online diabetes education program if deemed necessary. These will include modifying the content and format of the training modules and providing additional support and resources to the school nurses. By using the PDSA cycle, the effectiveness of the online diabetes education program for school nurses can be continuously evaluated and improved. The cycle allows for ongoing learning and refinement, which can lead to better outcomes for the school nurses and the students with diabetes whom they serve.

**Measures and Analysis**
The project's purpose was to indirectly but substantially improve the diabetes care of school-age children attending an urban public school district. The overarching aim was to develop, implement, and evaluate an asynchronous online competency-based diabetes education program for school nurses to increase nurses’ competency, knowledge and skills, and confidence. The measures chosen for evaluating the processes and outcomes of the online education program are depicted in Table 1. Analysis to evaluate the improvement project included qualitative reporting, frequency and proportions, change, and percentage improvement.

**Table 1**

<table>
<thead>
<tr>
<th>Outcomes/outputs</th>
<th>How to operationalize measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet as a group and create an asynchronous online diabetes education program, assessment tools, and competency checklist</td>
<td>Participation of stakeholders; Creation of online program, assessments, and checklist</td>
</tr>
<tr>
<td>Recruit 5-10 school nurses to protest the education program</td>
<td>Feasibility, clarity</td>
</tr>
<tr>
<td>85% of school nurses participated in the education program</td>
<td>Participation &amp; Completion of pre- and post-survey of competency, knowledge and skills, and confidence, satisfaction survey, &amp; the education program</td>
</tr>
<tr>
<td>85% of school nurses will have improvement in competency, knowledge and skills, and confidence to care for school age children with diabetes</td>
<td>Knowledge competency will be measured by multiple-choice and true-false questions, skill competency on diabetes technology will be measured by a self-report checklist, and confidence will be measured by a Likert scale</td>
</tr>
<tr>
<td>85% of school nurses were satisfied with the education initiative</td>
<td>Satisfaction will be measured by a Likert scale. Satisfaction measures: feasibility, accessibility, clarity, informative, value added</td>
</tr>
</tbody>
</table>

The first aim of the intervention was to *convene stakeholders to develop an asynchronous online competency-based diabetes education program for school nurses*. The expected outcome was to meet as a group and create an asynchronous online diabetes education program, assessment tools, and a skills checklist. This was measured by participation of the stakeholders,
development of the online program, surveys, and a skills checklist. The information was obtained from a data tracking tool which included names of the participants, date of the meeting, development of the education program, development of the surveys, and length of the meeting. To maintain confidentiality, stakeholders' names were excluded from shared data. There was no comparison group for this measure. The meeting minutes and communication log underwent qualitative analysis.

The intervention's second aim was to deploy the program to a small group of school nurses in an urban public school district to assess feasibility and clarity of the education program. The expected outcome was to recruit five to ten school nurses to pilot the education program. This was measured by assessing feasibility and clarity. The information was obtained from school nurses who participated in the pilot and completed a survey. A data tracking tool was utilized to record the participants’ names and survey responses to four Likert scale questions and a free-text question. To maintain confidentiality, participants’ names were excluded from shared data. There was no comparison group for this outcome. Analysis occurred using frequency and proportions.

The third aim of the intervention was to deploy an asynchronous online diabetes education program to school nurses in an urban public school district. The expected outcome was that 85% of school nurses participated in the education program. This was measured by participation and completion of pre- and post-knowledge, skills, and confidence surveys, a satisfaction survey, and the education program. The information was obtained from a data tracking tool which included a participant’s name and whether they completed the program. To maintain confidentiality, participants’ names were excluded from shared data. There was no
comparison group for this measure. Analysis was frequency and proportion of nurses who participated in the education program.

The fourth aim of the intervention was that school nurses who engage in the asynchronous online diabetes education program will have an increase in competency, knowledge and skills, and confidence to care for school age children with diabetes in an urban public school district. The expected outcome was that 85% of school nurses would have improvement in competency, knowledge and skills, and confidence to care for school-age children with diabetes. This outcome was measured by knowledge competency of diabetes care management with multiple-choice questions, skill competency on diabetes technology and skills by a self-assessment checklist, and confidence measured by a Likert scale. The information was obtained from a survey of correct answers to knowledge questions, self-report of skill competency checklist, and a 5-point Likert scale for confidence. Two data tracking tools, one for the pre-test, and one for post-test were used. Information included the participants’ names and participants’ answers to each of the survey items. To maintain confidentiality, participants’ names were excluded from shared data. The comparison group for this measure was pre- and post-implementation. Frequency, proportion, change, and percent improvement was quantitatively analyzed.

The fifth aim of the intervention was that school nurses who engage in the asynchronous online diabetes education program will be satisfied with the education initiative. The expected outcome of this aim was that 85% of participating school nurses were satisfied with the education initiative. Satisfaction was measured by a Likert scale assessing feasibility, accessibility, clarity, informativeness, and value enhancement. The information was obtained from a post-program survey. A data tracking tool recorded the participant’s name, excluded from
shared data, and the participant’s answers to the Likert scale items. There was no comparison
group for this measure. Frequency and proportion of participants and how they rated the
satisfaction dimensions were analyzed.

Three surveys were conducted for this project. The first survey, Appendix F, was
administered one time to seven school nurses during pre-implementation of the program. The
expected outcome that the survey measured was to recruit five to ten school nurses to pretest the
education initiative. The domains measured were feasibility and clarity. The Constructivist
learning theory’s dimensions of engagement, supportiveness, and effectiveness were included in
the tool (Piaget et al., 1973). The survey included four, 5-point Likert scale questions (strongly
disagree 1 to strongly agree 5) and a free-text question. Questions included wording such as “the
program delivery method was effective,” “the program was relevant and applicable to diabetes
care,” “the activity met the objectives,” and “the program will be impactful.” A response of
agree-4 or strongly agree-5 was considered as a positive response. A free-text response for
suggestions or feedback regarding the program was included.

The second survey, Appendix G, was completed by school nurses pre- and post the
education program. The expected outcome measured was that 85% of school nurses would have
improvement in competency, knowledge and skills, and confidence to care for school-age
children with diabetes. The domains measured were competency, knowledge and skills, and
confidence. The survey included engagement, supportiveness, and effectiveness dimensions from
the Constructivist learning theory (Piaget et al., 1973). The pre- and post-test included eight
multiple-choice and five true-false items obtained from the learning objectives, content, and
resources provided in the education program. A self-assessment of ten diabetes skills (blood
glucose monitoring, continuous glucose monitor, glucagon administration, insulin by pen, insulin
by pump, ketone assessment, carbohydrate counting, insulin to carbohydrate calculation, correction factor calculation) competency checklist, recorded as yes, no, or needs improvement, and a 5-point Likert scale question (strongly disagree 1 to strongly agree 5) regarding confidence in providing care to students with diabetes were also included in the survey. The survey was reviewed by leadership and seven school nurses, and it was determined that revisions for content or clarity were not needed.

Third, a survey for school nurses was administered post-program, Appendix H, to measure the expected outcome that 85% of school nurses were satisfied with the education initiative. Satisfaction domains measured included feasibility, accessibility, clarity, informativeness, and value added. The survey tool also included the dimensions of engagement, supportiveness, and effectiveness from the Constructivist learning theory (Piaget et al., 1973). The survey was comprised of five questions rated on a 5-point Likert scale, ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). Questions included wording such as “the program delivery method was effective,” “the program was relevant and applicable to diabetes care,” “the activity met the objectives,” “the program was valuable,” and “the program will have an impact on how I practice.”

Ethical Considerations

Implementation of the asynchronous online competency-based diabetes education program raises several ethical considerations. First, consent by email acceptance was obtained from the nurses before they participated in the program. Nurses were told they would not be penalized if they did not attend the training. The program also ensured that the nurses' privacy and confidentiality were protected, especially concerning any obtained knowledge or skills. Second, the program was designed and delivered in a manner that was accessible and inclusive to
all participating nurses, to promote equity and fairness in the provision of healthcare services. Nurses were able to complete the training at a convenient time for them. Third, the program was evidence-based, and any claims made regarding the efficacy of the program were based on reliable and valid data. The program also provided accurate and up-to-date information about diabetes care and management and avoided promoting any unproven or potentially harmful treatments or practices. Finally, the program will be monitored and evaluated regularly to ensure that it remains effective and meets the needs of the participating nurses and the children for whom they care. Any feedback or concerns raised by the nurses or other stakeholders will be addressed promptly and appropriately.

The online competency-based diabetes education program was an improvement project that occurred in a large urban public school district. The initiative was a quality improvement project and did not need Institutional Review Board [IRB] approval from the public school district. The public school district approved using district statistics if the numbers were overall district numbers without student characteristics breakdown, as this would ensure students cannot be identified and should not lead to suppression if the numbers are greater than 10.

The University of Massachusetts Boston Clinical Quality Improvement Checklist (Appendix I) was completed and verified that this project meets the criteria of quality improvement. The project proposed is quality improvement and does not meet the definition of human subjects research because it is not designed to generate generalizable findings but rather to provide immediate and continuous improvement feedback in the local setting in which the projects is carried out. The University of Massachusetts Boston IRB has determined that quality improvement projects do not need to be reviewed by the IRB.

Results
The first aim of the project was to *convene stakeholders to develop an asynchronous online competency-based diabetes education program for school nurses*. This was accomplished by stakeholders, including the school nurse senior director, case management resource nurse, special projects manager, and the project leader, convening on multiple occasions during which time the asynchronous online diabetes education program, including the education video, pre- and post-test survey, and satisfaction survey, were developed (Appendix J). The school nurse senior director, along with the project leader, determined that an asynchronous online diabetes education program was best suitable to increase nurses’ competency, knowledge and skills, and confidence to care for school-age children with diabetes in the large urban public school district. The case management resource nurse and the project leader spent most of the meeting time developing, revising, and finalizing the education video content. The project leader met with the special projects manager to determine the google classroom platform that was used, review the surveys, and ensure participant access to the education program. Meeting dates and length of times were recorded. The first aim was successfully met.

The second aim was to *deploy the program to a small group of school nurses in an urban public school district to assess the feasibility and clarity of the education program*. The outcome was to recruit five to ten school nurses to pilot the education program. Seven school nurses participated in the pilot, an online diabetes education program, and completed a survey to measure feasibility and clarity of the program. The survey consisted of four 5-point Likert scale questions and one free text question. Positive responses (agree-4/strongly agree-5) to each question were analyzed (Figure 2). The proportion of positive responses for each question was calculated in relation to the total number of responses for that question. An overall score was calculated for each participant based on the number of positive responses (agree-4/strongly
agree-5) in relation to all four questions. The mean positive response for Questions 1-4 was 100%. After individual scores were calculated, an aggregate mean for all participants was calculated and was 100%. Question 5, a free text question, regarding suggestions or feedback about the program was answered by five of the seven nurses. Answers to the free text question included, “this is a great diabetes review for school nurses,” “this is fabulous. There is so much great information and reminders for those of us that do it daily. I wish I had this type of training when I first became a school nurse!! I think it should be a PD for all school nurses,” “providing this training to all … nurses will elevate the level of care provided across all schools in the district,” “the educational module was very informative and I enjoyed the scenarios how to calculate the IC. The module was easy to follow and to the point. Great work,” and “great job! Thank you for providing this training.” The second aim was successfully met.

The third aim of the program was to deploy an asynchronous online diabetes education program to school nurses in an urban public school district. The desired outcome was that 85% of school nurses participate in the education program. One hundred and fifty-eight school nurses were employed in the large urban public school district at the time of the project implementation. Of the 158 nurses, one nurse was the leader of the quality improvement project, seven nurses
participated in the pilot education program, and six nurses were on medical leave, leaving 144 nurses invited to participate in the online diabetes education program. As participation rates were being assessed during implementation, it was determined that strategies were needed to recruit nurses to participate. Over the eight-week implementation time, weekly reminders were sent to nurses to participate, inspirational quotes were added, a project update was included, and an incentive raffle for a gift card for four participants who completed the entire program was added. Also, if it was noted that a participant had completed only part of the program, an individual email was sent to them to complete all parts. Of the 144 school nurses, 60% (n=87) nurses accepted the invitation to participate in the program and began the program (Figure 3). Among the 87 participants, 34% (n=49) completed all steps of the program including the pre-test, education video, post-test, and post-program satisfaction survey. The third aim of the program was not achieved with an initial participatory rate of 60%.

Figure 3

The fourth aim of the project was that school nurses who engage in the asynchronous online diabetes education program will have an increase in competency, knowledge and skills, and confidence to care for school-age children with diabetes in an urban public school district. The expected outcome was that 85% of school nurses would have an improvement in
competency, knowledge and skills, and confidence to care for school-age children with diabetes. Of the 60% (n=87) of school nurses who accepted the invitation to participate in the diabetes education program, 49 school nurses completed the program including the pre-test, education video, post-test, and post-program satisfaction survey.

The pre- and post-test survey focused on measuring diabetes competency, knowledge and skills, and confidence. The overall mean knowledge score for the pre-test was 87% and the post-test was 93% which represents a change of 6 points, an almost 7% improvement in diabetes knowledge (Figure 4). Of the 49 participants who completed the entire program, 67% (n=33) had an improvement in knowledge. Individual questions were analyzed to identify which questions were most improved pre- versus post-test. Two questions with the greatest improvement in knowledge were Question 4 which asked, “Hyperglycemia is usually treated with” showed a 21% improvement and Question 7 which asked, “Glucagon is administered by” showed a 51% improvement. Participants answered question one which asked, “What is diabetes” incorrectly 33% (n=16) in the pre-test and incorrectly 31% (n=15) in the post-test.

Figure 4
Skill self-assessment scores were determined by the proportion of a particular response, “Yes, No, Needs Improvement,” to the total number of responses for that skill. A mean aggregate score for participants who answered “Yes” to being able to perform a skill pre-education module was 78% and post-education was 86%, a change of 8 points and improvement of just over 10% (Figure 5).

**Figure 5**

![Skill Assessment Chart]

All ten skills assessed showed at least one instance of an increase in "Yes" responses. Fifty-nine percent (n=29) of participants had at least one skill self-assessment answer of a “No” or “Needs Improvement” improved to a “Yes”. Each skill response was then analyzed to determine the greatest improvement of a skill self-assessment pre- versus post-test. Glucagon administration showed the greatest improvement of 32%. Glucagon administration (37%), insulin by pump (40%), and correction factor calculation (33%) were identified as the skills that participants answered most with a “No” or “Needs Improvement” collectively.

The overall mean confidence score pre-education was 78% and post-education 92% which represents a change of 14 points which is an almost 18% improvement in confidence in diabetes management (Figure 6). Of the 49 participants, 43% (n=21) had an improvement in
confident. Thus, the survey results revealed 7% improvement in knowledge, 10% improvement in skill self-assessment, and 18% improvement in confidence when comparing pre- and post-survey results. The fourth aim was not successfully met.

**Figure 6**

The fifth aim was that school nurses who engage in the asynchronous online diabetes education program will be satisfied with the education initiative. The desired outcome was that 85% of school nurses would be satisfied with the education initiative. Five Likert scale questions in the post-program survey were completed by 49 school nurses measuring satisfaction with the education program. Initially, the post-program satisfaction survey was planned for the post-implementation phase. However, to enhance the project's cohesiveness, it was made available to participants immediately after they completed the post-test survey.
Mean scores for the post-program satisfaction survey for each question were 94% (n=46) for program effectiveness; relevance and applicability to diabetes care 100% (n=49); meeting objectives 100% (n=49); value 98% (n=48); and impact on providing diabetes care 96% (n=47). Overall, 98% of participants were satisfied with the online diabetes education program (Figure 7). The fifth aim was successfully met with a 98% satisfaction rate.

Figure 7

Discussion

Summary

The purpose of this project was to indirectly improve the diabetes care of school-age children who attend an urban public school district. The overarching aim of this quality improvement project was to develop, implement, and evaluate an asynchronous online competency-based diabetes education program for school nurses to increase nurses’ competency, knowledge and skills, and confidence. This aim was successfully achieved, as demonstrated by the project results. The quality improvement initiative result of 7%, 10%, and 18% improvement in competency, knowledge and skills, and confidence respectively were consistent with the literature review which revealed that diabetes education increases nurse’ competency, knowledge
and skills, and confidence to care for school-age children with diabetes (Rhodes et al., 2019; Shimaski et al., 2021; Taha et al., 2018; Zimmerman et al., 2022).

The constructivist learning theory was beneficial in developing the diabetes education program because it provided a more engaging, supportive, and effective learning experience. This was evidenced in the pilot survey result of 100% and the post-program satisfaction survey result of 98% of participants finding the program being effective, relevant, and applicable, valuable, and impactful in providing diabetes care to school-age children.

The project's most significant strength was the development of a comprehensive diabetes education program. This program is a vital resource for school nurses, offering evidence-based content designed to address the unique needs of district nurses. Despite the results of the project, the development of this diabetes education resource stands out as a pivotal accomplishment.

**Interpretation**

Overall, the quality improvement project yielded positive results. The project brought together the urban public school district and key stakeholders to collaboratively identify a significant problem, develop a comprehensive solution, implement an effective plan, and evaluate its success. This collaborative approach not only addressed the immediate issue, insufficient nursing knowledge, but also provided a valuable resource for future applications and programs. Additionally, informal feedback indicated strong support for the initiative, highlighting its potential to serve as a model for similar educational programs in the future.

Although the outcome goal percentage (85%) of participants was not met in aim #3, 60% of school nurses did initiate participation in this large school district which is an accomplishment, considering the responsibilities and workload of school nurses. The anticipated participatory rate and the observed rate may have been affected by participants’ perception that
the diabetes education program was voluntary and not a district mandate, nor could professional development hours or continuing education hours be obtained. Additionally, although the aim #4 percentage goal of 85% improvement in knowledge and skills and confidence was not met, data revealed that participants’ knowledge (7%), skills (10%), and confidence (18%) did evidence improvement. Furthermore, 67% (n=33) of participants did have an improvement in knowledge, 59% (n=29) had at least one skill self-assessment improved to a “Yes”, and 43% (n=21) had an improvement in confidence. School nurses in the district are highly educated professionals, each holding at least a bachelor’s degree, which ensures a small margin of error in their diabetes knowledge competency. Thus, actual outcomes of this quality improvement project indicate that an online diabetes education program increases nurses’ competency, knowledge and skills, and confidence in managing diabetes in school-age children. Lastly, this project addressed barriers to obtaining continuing education which include time constraints, cost, family obligations, lack of available substitute coverage at school, and the inability to attend during the school year.

**Limitations**

Several limitations were identified during the implementation of the quality improvement project. One limitation identified in the diabetes education program was voluntary participation by school nurses. School nurses who did not have students with diabetes in their school assignment may have been less likely to participate compared to those who did. This may have influenced competency improvement rates, as nurses with more diabetes knowledge may have been more likely to participate, potentially resulting in smaller changes in improvement scores. To address this concern, weekly reminders were sent to nurses to participate, inspirational quotes were added, a project update was included, and an incentive raffle for a gift card for four participants who completed the entire program was added. Next, if it was noted that a participant
had only completed part of the program, an individual email was sent to that participant to complete all parts of the program. Anecdotal feedback indicated that the reminders were helpful, with participants expressing gratitude for receiving them. As a result, participation rates increased following the distribution of the reminders. Another limitation, highlighted by a participant's feedback, was that the numerous steps required to complete the program were burdensome. Each step in the program ensured that nurses completed each component of the education program sequentially. This included completing the pre-test, watching the video, taking the post-test, and then filling out the post-program satisfaction survey. The surveys assessed the program's effectiveness and were used solely for this quality improvement project. Implementing a more streamlined process and conducting usability surveys would be beneficial in the future.

A key consideration for the future is to have the diabetes education program recognized as professional development hours as part of the 18-hour school nurse licensure requirement in the state or offering continuing education hours for engaging in the program to enhance school nurse participation. Additionally, standardizing and mandating the program for district school nurses as part of their orientation and training will ensure it is completed by all. Lastly, future work should consider studying the impact of the diabetes education program on students' diabetes care.

**Conclusions**

Implementation of the locally tailored asynchronous online diabetes education program was effective in increasing nurses’ competency, knowledge and skills, and confidence to care for school-age children with diabetes. Diabetes is a prevalent condition among school-age children and the complexity of diabetes care is challenging. Diabetes education is an invaluable,
evidence-based resource that enables school nurses to effectively manage the health outcomes and overall well-being of children with diabetes throughout the school day. Involving stakeholders in the development and implementation of this diabetes education project has important implications for the program's future sustainability. Beginning in the fall of 2024, diabetes is one of the chronic conditions identified in this school district for which professional development will be mandatory for school nurses. This diabetes education project will be valuable for this purpose and will also serve as a resource for the district to develop educational programs about other chronic conditions.
References


Magnussen, L. (2008). Applying the principles of significant learning in the e-Learning environment. *Journal of Nursing Education, 47*(2), 82-86. [https://doi.org/10.3928/01484834-20080201-03](https://doi.org/10.3928/01484834-20080201-03)


https://doi.org/10.4081/jphr.2015.467


https://doi.org/10.1016/j.nepr.2019.06.009


https://doi.org/10.21225/D59S3Z


https://doi.org/10.1177/1059840519861748


https://doi.org/10.3390/ijerph192416576


### Appendix A

**Summary/synthesis evidence table**

**Project PICO:** Among school nurses who care for school age children with diabetes (P), does the implementation of an on-line diabetes continuing education program (I) improve nurses’ competency (O) to care for school age children with diabetes in the literature (C)?

**Summary Table**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Studies</th>
<th>Summary of Significant Findings</th>
<th>Sample Description</th>
<th>Level &amp; Quality of Evidence</th>
</tr>
</thead>
</table>
| **In Person Continuing Education (CE) Program**   | A. Berget, C., et al. (2019) Group, one session, 2 hours  
B. Breneman, C.B., et al. (2015) Group, one session, one-day | A. Diabetes competency (care tasks and pathophysiology) (Likert scale) improved 2.7%-31.8%. No direct skill assessment.  
B. Level of self-rated experience and competency in providing diabetes care (Likert-type scale) increased 16-40%. (Symptom management, administration of medication, diet and activity management, and teaching and supporting others). No direct skill assessment. | A. N= 30 (School nurses)  
Mean years of nursing experience- 19.5 years  
BSN=70%  
Suburban or urban-93%  
B. N=105 (School nurses)  
Years of experience-5+ 73% Bachelor’s-45% | A. III, A  
B. III, B |
| **Online Continuing Education (CE) Program**      | C. Rhodes, D., et al. (2019) Individual, one session, rapid (time not specified)  
D. Shimasaki, S., et al. (2021) | C. T-test results indicated a significant increase (p< 0.001), 45.0-99.6% in knowledge post-test (diabetes management equipment, diet, psychological impacts, and type 2 techniques)  
D. Changes in Self-Efficacy (patho of diabetes, insulin technology, insulin management, developmentally appropriate care): (Post series) increased 25% (p,.001, r >.5).  
E. Significant knowledge (diabetes basics, hypoglycemia, hyperglycemia, and ketones) gained from comparing the percentage of correct answers in all modules between pre- | C. N=1127 (School nurses)  
D. N=48 (School nurses)  
Female- 100%  
White-88%  
Age 40-59- 83%  
Bachelor’s degree-92% | C. III, B  
D. III, A  
E. III, B  
F. III, B |
<table>
<thead>
<tr>
<th>Group, 2 cohorts, four, 1-hr weekly sessions</th>
<th>questionnaire scores and post scores, 18-52% (p value &lt;0.0001) immediately post-program, at 6 months, and at 12 months. Confidence score was 61.86%.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Taha, N., et al. (2018)</td>
<td>F. Data analyses revealed an improvement of 74-84%, p&lt;0.001, on all knowledge scales including technology, basic management, hyperglycemia, and ketone management.</td>
</tr>
<tr>
<td>Self-paced, one-day, 4 modules, 120 minutes total</td>
<td></td>
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<tr>
<td>F. Zimmerman, C., et al. (2022)</td>
<td></td>
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<tr>
<td>Group, one session, 3 modules, 2 hours</td>
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</tr>
<tr>
<td></td>
<td>Profession &gt;16 years-65%</td>
</tr>
<tr>
<td></td>
<td>E. N= 124  Female-69.15%  Age 25-44- 83.08%  Bachelors-81.91%  School nurses-14.89% Years of experience &lt;15 years-78.73%</td>
</tr>
<tr>
<td></td>
<td>F. N= 88, n=67 (training program, research); school nurses n=52 78%</td>
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</tbody>
</table>
Appendix B

Microsystem map

Mapping Tool

3. School nurses’ needs to care for a student with diabetes
   a. Communication with family
   b. Medication orders
   c. Individualized health plan
   d. 504 plan
   e. Medical supplies
   f. Teacher education
   g. Communication with school community (need to know staff)
   h. School menu ingredients
   i. Diabetes training

Improvement Ideas:
School nurse training to increase nurses’ competency to care for school-age children with diabetes.
Appendix C
Cause and Effect Diagram

Fishbone diagram

People
- Nurse
  - lack of education
  - lack of training
  - limited experience (no tech skills)
  - no confidence
- Student(s) with diabetes is present at a school
  - Children(ren) with limited understanding of their condition

Process
- No standardized school nurse orientation
- No diabetes competency training
- No district policy and procedure on diabetes management

Equipment
- Not familiar with glucometer use
- Not familiar with CGM (continuous glucose monitor)
- Not familiar with insulin administration
- Not familiar with insulin pump

Limited access to resources
- No access to up-to-date resources
- No access to guidelines

Barriers to attending diabetes continuing education
- time constraints
- cost
- family obligations
- lack of sub coverage

Insufficient school nurse competence, knowledge and skills, and confidence to care for children with diabetes

Isolation
- only 1 nurse at the school

Management
- Limited experience with students with diabetes

School administrator is not a medical professional
- Health services does not have a standard orientation
Appendix D

Force field analysis

[Diagram of Force Field Analysis]

- Current driving forces:
  - Nurses need & want
  - No existing district diabetes training/orientation

- Potential driving forces:
  - Increase nurse knowledge competency and confidence
  - Improved health outcomes
  - Standardized nurse education program

- Current restraining forces:
  - Fear of change (leadership & nurses)
  - Identifying a training resource(s) to use
  - Time to develop a training program

- Potential restraining forces:
  - Time for training to occur
  - Staff compliance with completing the training
  - Updating training information (EBP) annually

Implementing an online diabetes education program
Appendix E
Logic Model

**Problem:** Insufficient school nurse competency, knowledge and skills, and confidence to care for school-age children with diabetes in a diverse urban public school district.

**Inputs**
- Leadership
- School nurses
- Access to database
- IT
- Time
- Email addresses of school nurses
- ADA
- NASN
- BCH endocrinology
- Pre- & post-assessment databases

**Activities**
- PRISMA literature review of strategies
- Form Stakeholders/Team
- Convene Stakeholders/Team
- Identify education platform
- Plan development of education program
- Identify assessment tools

**Outputs**
- Develop asynchronous online diabetes program
- Develop assessment tools

**Short-term outcomes 2 weeks**
- Pilot asynchronous online diabetes education program to 5-10 school nurses for feasibility, clarity, and revisions as necessary.

**Intermediate outcomes 1 month**
- Email invitation accepted by 85% of school nurses
- Deploy pre-training assessment tools to 85% of school nurses

**Long-term outcomes 3 months**
- 85% of school nurses will have improvement in competency, knowledge and skills, and confidence to care for school-age children with diabetes
- 85% of school nurses found the education to be feasible, accessible, clear, informative, preparatory, and delivery method added value to care of children with diabetes

**Purpose:** The purpose of this project is to improve the care of school-age children with diabetes who attend an urban public school district by implementing an asynchronous online diabetes education program for school nurses to increase nurses’ competency, knowledge and skills, and confidence.

**Rationale & Assumptions:** School nurses want education to care for school-age children with diabetes. The large urban public school's leadership supports professional development for school nurses. Guidelines from the American Diabetes Association and the National Association of School Nurses support, recommend, and identify continuing education as a professional responsibility.
Appendix F

Pre-Test (Pilot) Survey

Diabetes Education Program: Pilot survey
Pilot: Please complete the following survey. Questions 1-4 are scale questions, strongly disagree 1 to strongly agree 5. Question 5 is a free text question. The answers will be used to assess feasibility and clarity of the diabetes education program.

1. Email *

2. 1. The program delivery method was effective.
   Mark only one oval.
   
   1 2 3 4 5
   Strongly agree

3. 2. The program was relevant and applicable to diabetes care in Boston Public Schools.
   Mark only one oval.
   
   1 2 3 4 5
   Strongly agree

4. 3. The activity met the objectives.
   Mark only one oval.
   
   1 2 3 4 5
   Strongly agree

5. 4. The program will be impactful in providing diabetes management/care to students.
   Mark only one oval.
   
   1 2 3 4 5
   Strongly agree

6. 5. Please write any suggestions or feedback regarding the program.

   
   
   
   

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Google Forms
Appendix G

Pre-Test/Post-Test Survey

Diabetes Quiz
Pre-Test/Post-Test: Please circle the correct answer for each question.

1. Email *

2. What is diabetes?
   Mark only one oval.
   - A. Body produces too much glucose
   - B. Body does not make or use insulin properly
   - C. Joints are stiff and painful
   - D. A and B

3. Which of the following are the types of written plans a student with diabetes might have?
   Mark only one oval.
   - A. Section 504 Plan
   - B. Diabetes Medical Management Plan
   - C. Individualized Health Care Plan
   - D. Emergency/Disaster Plan
   - E. All the above

4. What causes hypoglycemia?
   Mark only one oval.
   - A. Too much insulin
   - B. Too little food or delayed meal/snack
   - C. Unanticipated physical activity
   - D. All of the above

5. Hypoglycemia is usually treated with:
   Mark only one oval.
   - A. A peanut butter and jelly sandwich
   - B. Water
   - C. Glucose tabs
   - D. Insulin
   - E. B and D

6. When should blood glucose levels be routinely checked?
   Mark only one oval.
   - A. Every hour
   - B. Every time student comes to the clinic
   - C. According to the schedule in the student's IEP
   - D. Never at school
7. All CGMs are indicated for treatment decisions? 8 points
   Mark only one oval.
   True
   False

8. Glucagon is administered through? 8 points
   Mark only one oval.
   A. Mouth
   B. Injection
   C. Nasal powder
   D. Pen or auto-injector
   E. B, C, and D
   F. All the above

9. Basal insulin is a slow steady stream of insulin? 8 points
   Mark only one oval.
   True
   False

10. Most pumps can calculate insulin dosages based on carbohydrate intake and blood glucose levels entered into the device? 8 points
    Mark only one oval.
    True
    False

11. Ketones are checked by using? 8 points
    Mark only one oval.
    A. Saliva
    B. Urine
    C. Blood
    D. Body temperature
    E. a and b
    F. B and C

12. An insulin to carbohydrate ratio is determined by the student's provider and is used to calculate meal/snack insulin? 7 points
    Mark only one oval.
    True
    False

13. What is the goal of sick day care? 8 points
    Mark only one oval.
    A. Manage hyperglycemia
    B. Reduce or prevent ketones
    C. Manage or prevent hypoglycemia
    D. Prevent DKA
    E. All of the above
14. 13. Students who have type 2 diabetes may need to take insulin? 7 points

Mark only one oval.

☐ True
☐ False

15. 14. Please rate the following statement:
I am confident in providing diabetes management/care to students.

Mark only one oval.

1 2 3 4 5

Strongly agree

16. 15. Please self-report your competence with the following skills: (Yes, No, needs improvement)
Check all that apply

<table>
<thead>
<tr>
<th>Skill</th>
<th>Yes</th>
<th>No</th>
<th>Needs improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood glucose monitor</td>
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<tr>
<td>Continuous glucose monitor</td>
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<tr>
<td>Glucagon administration</td>
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<tr>
<td>Insulin administration by syringe and vial</td>
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<td>Insulin administration by pen</td>
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<td>Insulin administration by pump</td>
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<td>Ketone assessment</td>
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<td>Carbohydrate counting</td>
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<td>Insulin to carbohydrate calculation</td>
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<tr>
<td>Correction factor calculation</td>
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</table>
Appendix H
Post-Program Satisfaction Survey

Diabetes Quiz
Pre-Test/Post-Test: Please circle the correct answer for each question

1. Email

2. 1. What is diabetes?
Mark only one oval.
- A. Body produces too much glucose
- B. Body does not make or use insulin properly
- C. Joints are stiff and painful
- D. A and B

3. 2. Which of the following are the types of written plans a student with diabetes might have?
Mark only one oval.
- A. Section 504 Plan
- B. Diabetes Medical Management Plan
- C. Individualized Health Care Plan
- D. Emergency/Disaster Plan
- E. All the above

4. 3. What causes hypoglycemia?
Mark only one oval.
- A. Too much insulin
- B. Too little food or delayed meal/snack
- C. Unanticipated physical activity
- D. All of the above

5. 4. Hypoglycemia is usually treated with:
Mark only one oval.
- A. A peanut butter and jelly sandwich
- B. Water
- C. Glucose tabs
- D. Insulin
- E. B and D

6. 5. When should blood glucose levels be routinely checked?
Mark only one oval.
- A. Every hour
- B. Every time student comes to the clinic
- C. According to the schedule in the student’s DMMP
- D. Never at school
# Appendix I

## Clinical Quality Improvement Checklist

<table>
<thead>
<tr>
<th>CLINICAL QUALITY IMPROVEMENT CHECKLIST</th>
</tr>
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<tbody>
<tr>
<td>Date: 3/31/2023</td>
</tr>
<tr>
<td>Project Leader: Kristina Donovan</td>
</tr>
<tr>
<td><strong>Project Title:</strong> Implementation of an online competency-based education program for school nurses.</td>
</tr>
<tr>
<td><strong>Institution where the project will be conducted:</strong> Large urban public school district</td>
</tr>
</tbody>
</table>

**Instructions:** Answer YES or NO to each of the following statements about QI projects.

1. The specific aim is to improve the process or delivery of care with established/accepted practice standards, or to implement change according to mandates of the health facilities’ Quality Improvement programs. There is no intention of using the data for research purposes. **YES**

2. The project is **NOT** designed to answer a research question or test a hypothesis and is **NOT** intended to develop or contribute to generalizable knowledge. **NO**

3. The project does **NOT** follow a research design (e.g. hypothesis testing or group comparison [randomization, control groups, prospective comparison groups, cross-sectional, case control]). The project does **NOT** follow a protocol that overrides clinical decision-making. **NO**

4. The project involves implementation of established and tested practice standards (evidence-based practice) and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does **NOT** develop paradigms or untested methods or new untested standards. **NO**

5. The project involves implementation or care practices and interventions that are consensus-based or evidence-based. The project does **NOT** seek to test an intervention that is beyond current science and experience. **NO**

6. The project has been discussed with the QA/QI department where the project will be conducted and involves staff who are working at, or patients/clients/individuals who are seen at the facility where the project will be carried out. **NO**

7. The project has **NO** funding from federal agencies or research-focused organizations, and is not receiving funding for implementation research, or the clinical practice unit (hospital, clinic, division, or care group) agrees that this is a QI project that will be implemented to improve the process or delivery of care. **NO**

8. The project leader/DNP student has discussed and reviewed the checklist with the project Course Faculty. The project leader/DNP student will **NOT** refer to the project as research in any written or oral presentations or publications. **NO**

**ANSWER KEY:** If the answer to **ALL** of these questions is **YES**, the activity can be considered a Clinical Quality Improvement activity that does not meet the definition of human research. **UMIRB review is not required.** Keep a dated copy of the checklist in your files. **If** the answer to **ANY** of these questions is **NO**, the project must be submitted to the IRB for review.
Appendix J

Data Tracking Tool Aim #1 Results

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